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ABSTRACT

This report summarizes field work in Ororo Community School located in Tokorara, a suburb of Port Moresby, the capital of Papua New Guinea. It is one of five community schools participating in the ongoing research and development efforts of the Indigenous Mathematics Project (IMP). The study opens with an introduction to the site, the school setting, and the community setting. Since Ororo is the largest city in Papua New Guinea, more resources were available than at other sites. One grade 2, two grade 4, and one grade 6 classes were involved in the study, with a teacher who taught mainly in a "fill-in-the blank" manner. He had few problems implementing the IMP materials, although he did have some management and organizational difficulties which resulted in pacing problems. Suggestions are made for improving both the teacher's notes and the learning aids. Observation of classroom interaction revealed that English was the predominant language, although both Pidgin and vernacular were used at times. Many lessons were "dictated" to the class with little interaction. Finally, brief comments on student interviews are reported. In the summary, the need for differentiated instruction is noted and suggestions for distance teaching using radio broadcasts are included. (MNS)

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INDIGENOUS MATHEMATICS PROJECT

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ORORO COMMUNITY SCHOOL FIELD REPORT

Julie Diane Lineberger

Working Paper 7
November 1980

THE INDIGENOUS MATHEMATICS PROJECT

This series of working papers and research reports has been published to provide a comprehensive source of documentation on research and development efforts associated with the Indigenous Mathematics Project. The Project was established in 1977 by the Government of Papua New Guinea to investigate various aspects of traditional mathematics development. During the first phase (1977–79) of the five year program, basic research in crosscultural cognitive development was carried out and indigenous counting, classification and measurement systems used throughout the country were documented. During the second phase of the project (jointly funded by the Department of Education and UNESCO), pilot instructional materials were developed and trialled. The intent was to assess the feasibility of utilizing complementary aspects of indigenous and Western mathematics as a basis for developing culturally relevant student materials, instructional aids and teachers' guides which reflect the practical constraints of the community school environment. The results of IMP work are intended to inform future curriculum development in an effort to provide more appropriate instructional materials and learning aids for Community Schools throughout Papua New Guinea.

Series Editor: Randall Souviney
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INDIGENOUS MATHEMATICS PROJECT

Field Report

ORORO COMMUNITY SCHOOL

14 July - 22 August

by

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This report summarizes field work carried out at one of five community schools in Papua New Guinea participating in the ongoing research and development efforts of the Indigenous Mathematics Project.

ORORO COMMUNITY SCHOOL

Ororo Community School is located in Tokorara, a suburb of Port Moresby, the capital of Papua New Guinea. The international airport is approximately one half an hour from Tokorara. It is possible to get a taxi or PMV (Public Motor Vehicle - small buses), for transportation to the June Valley section of Tokorara where Ororo Community School is situated. Transportation during the day is no problem - however PMVs stop at 6 pm and taxis (one is warned) are somewhat unsafe at night. There are plenty of cars, even a 5 pm traffic jam!

Environs

The terrain surrounding June Valley consists of hills covered with grass and gum trees. There are many fruit trees (paw-paw, banana, etc.) around the houses, but few vegetable gardens.

It takes about one half hour to drive to the sea via either of two roads. Main city roads are paved while most side streets in residential areas are not. Tokorara is a typical suburb of a large city with a gasoline station and supermarket close by. The community itself has two variety stores selling items from baby shoes to tinned butter. A fifteen minute PMV ride takes you to a large supermarket where supplies of almost anything are available, although they are expensive. The selection of fruits and vegetables and other fresh foods are poor, even at the traditional produce market across the street from the modern supermarket. Co-operative bulk buying of fresh foods is available, however it is mainly expatriates who subscribe to such services.

Housing

My housing in Tokorara was comfortable, complete with inside toilets and electricity. I resided with a teacher from Ororo and her family (mother, sister, brother-in-law, 2 sons) in a "Teacher House". The single family unit is built on 3 foot stilts and one is impressed by the cleanliness of the wooden floors. I was a bit astonished at the pictures of United States teeny-bopper idols on the wall (Rod Stewart, Donny Osmond, etc).

The one room structure of unfinished walls is partitioned off into three bedrooms, a general room and a toilet/washroom. The general room is where most living is done. It holds a stove, sink, cupboard, refrigerator on one side and a picnic table and school desk on the other side. It is well lit from the louvre windows by day and flourescent lights at night. The walls sport lap-laps (material used as a wrap around for clothing), baskets and other traditional artifacts.

One bedroom is occupied by the teacher, her two sons and her mother. Another houses her sister and brother-in-law. The third was cleared for me. It was furnished with nails to hang my clothes upon, a metal bed frame and thin foam mattress, a small table and chair (borrowed from the school for my benefit). I was also given thumb taks to put personal items so I could feel more at "home".

From the outset my new family went out of their way to make me feel comfortable. The first few days they were over generous in taking care of my nutritional needs, feeding me chicken, eggs, powdered milk, etc. - all European style food. This caused an obvious strain on the family's budget (visible by small arguments regarding money), even though I paid 2.00 kina daily for room and board. After a few intimate conversations the family reverted back to their preferred eating habits.

The main staple is rice, often served with kau kau (yams). Usually one form of "tinned meat" (canned mackeral, canned corned beef) was served along with pumpkin greens. The menu sometimes included a banana, or bread and jam, but seldom varied.

Initial Reaction

My initial reaction was filled with excited anticipation. On one level I was curious of how the teachers would accept me on a day to day working basis. I was hopeful that the children wouldn't think me too much of an oddity.

On another level I was surprised at the luxurious living conditions. I had been warned that I might not be too comfortable. Comparing Tokorara

to urban settings in Colombia, Ecuador, Peru, Mexico, where people are also moving from 'traditional' to 'modern' lifestyles, I found Tokorara clean and well organized.

Overall I was excited with the prospect of something new ... entering a society about which I knew little. I felt like a sponge soaking up every minute detail, relishing every drop.

The community was very curious about a white women living in their midst. The first two weeks we had many visitors. I was easily recognized and as soon as people knew me they were extremely helpful. For example, if I was waiting for a bus in town, someone would invariably say - "You're going to Tokorara, I'll tell you which bus." It was as if everyone was my wontok (Pidgin for someone who comes from the same area).

School Setting

Ororo Community School was built in 1972. At the time the Government was financing construction around the outskirts of Port Moresby to meet the demands of increasing population. The school and community were built at the same time by contracted construction workers.

The school consists of six two-room (store-room in the middle) buildings constructed out of plywood, with louvre windows, wood floors and tin roofs. Classrooms are built on high stilts. There is at least one black-board in each room. Grades 3, 4, 5 and 6 all have old wooden desks for the students' use. All of the classrooms have flourescent lighting.

As Ororo Community School had become a major walkway for the people of June Valley, a fence enclosing the school had just been completed (August 1980) to reduce the amount of foot traffic. The grounds have little grass. The students have constructed basketball and volleyball courts. There are two toilet houses for which the students contribute money for toilet paper.

Supplies and Equipment

As Ororo is in the largest city of Papua New Guinea, many resources are available. Science kits, scissors, glue, social science pictures, a 200 book library, maps, sports equipment and radios can all be checked out from the staff room. Each classroom has reading books (grades 3-6), paper, exercise books, pencils and rulers. Grades one and two have old Minenda reading books cut up and pasted on cards for reading. Grades 3-6 have text books for students in mathematics, reading, listening, and written expression. Teachers have a syllabus for every subject taught. Ororo has a duplicating machine (in working order), a phone and facilities for table tennis (used daily by teachers only). They have the Papua New Guinea flag, but the strings to raise it on the pole have disappeared.

School Committee

The school Board of Management is supposed to be elected annually. However, due to an apparent lack of interest on the part of the community, the current Ororo Board has been appointed by the Headmaster.

Ororo Community School Population

Grade level	Years experience	No. of boys	No. of girls	Total	Mean Age ($\bar{x}$)
1V	5	18	15	33	7.3
1	3	23	9	23	7.4
1B	8	20	12	32	7.6
2R	7	21	20	41	8.5
2T	1	21	22	43	9.2
3R	5	18	22	40	10.0
3B	7	24	17	41	10.0
4M	3	17	21	38	11.3
4W	10	19	17	36	11.3
5P	19	21	11	36	11.8
6E	8	18	18	36	12.2
Total	$\bar{x}$ = 6.9	224	184	408	$\bar{x}_T$ = 9.7

Ororo Daily Time Schedule

Time	Description
8:00 - 8:15	Assembly (MWF Outside)
8:15 - 10:00	Classes
10:00 - 10:30	TEA
10:30 - 12:00	Classes
12:00 - 1:00	LUNCH
1:00 - 3:00	Classes

Minutes Instruction Per Week - Ororo

Grade level	Maths	English	Science	Community Life	Expr. Arts	Physical Education	Other	Total
2	135	705	90	90	120	120	480	1740
4	210	600	60	270	180	120	270	1710
4 (control)	210	660	45	120	120	135	390	1680
6	240	660	90	240	120	150	180	1680

Implementation Study

The teacher (G.E.) involved in the actual implementation of the pilot materials has been teaching 8 years and is currently a senior teacher at Ororo. He completed grade 10 and applied to secondary teachers college, hoping to major in English. He had failed English in high school and wanted to improve his skills in order to be an effective teacher. His application was rejected due to poor grades. He became a clerk for national treasury, but found the work boring. He applied again to secondary teachers college, and was accepted. He attended one year and then a friend talked to him about the value of primary education, so he completed his community school teacher training.

Teaching Experience

Year	Grade	Description
1973	6	One year rural setting, children got sick, no hospital - went to city.
1974	1	Morobe Province - G.E. and family then moved closer to home.
1975	6	
1976	5	
1977	6	Ororo Community School
1978	5	
1979	6	
1980	6	

G.E. prefers a rural setting as "The community is more involved and interested in the school". He has applied to teach in his village (Central Province).

Teaching Styles

G.E. taught mainly in a Fill in the Blank (FIB) manner. He disseminated information to the whole class once, then went over the material again, pausing for students to fill in the blanks with the proper information. To introduce a lesson G.E. usually demonstrated to a small group with the rest of the class looking on. Students then returned to their seats to work individually.

G.E. taught according to his program schedule. He is particularly careful to ensure the educational radio schedule is always respected. Under no circumstances were the broadcasts (English, Geography, Science, Current PNG News) missed.

Subject Sample

EXPERIMENTAL AND CONTROL CLASSES - ORORO

Grade level	Boys	Girls	Total	Mean Age ($\bar{x}$)
2R	21	20	41	8.5
4M (control)	17	21	38	11.3
4W	19	17	36	11.3
6E	18	18	36	12.2
Total	75	76	151	$\bar{x}$ = 10.8

SUBJECTS ASSESSED - ORORO

Grade level	PMAT 2	TAS 1	COG	PMAT 3	TAS 2
2R	38	37	15	37	37
4M (control)	35	35	0	36	36
4W	33	33	15	34	34
6E	31	31	15	27	27
Total	137	136	45	134	134

Last year (1979) class 4W - then in standard 3 - was without a teacher for 6 - 8 weeks (their teacher deserted). Due to this problem class 4W is now known as the "slower standard four".

Curriculum Implementation

I had no trouble documenting the Curriculum Implementation. Many of the lessons set aside for Curriculum Implementation documentation were very straight forward. G.E. had no comments for lessons 2:53A, 53D, 53E, 53F, 53H, 53I; 4:144C, 144D, 146B; 6.1, 6.5, 6.10. Many other pre-interviews consisted of comments on how he would present the lesson.

The instructions for lessons 4:146A, 149F; 2:55A needed further explanation. For example, G.E. suggested that the introduction of division

(4:149F) be drawn out in the Teachers Notes as a graphic step-by-step guide. Mostly he suggested that the instructions in the Teacher's Notes be elaborated to assist teachers in presenting the lesson.

Implementation Problems Encountered

G.E. did not have many problems implementing the lessons as described. He had some management and organizational difficulties (i.e. 25 minutes spent to pass out materials for some lessons). He did well in working with groups, although he did not demonstrate an ability to foster interaction among individuals in groups.

He repeatedly requested more explicit information on how to teach the curriculum, as well as general background information. He seemed to want a script on how to explain a concept in front of him. In lesson 4:146C for instance, rules for the activity are simply listed in a column. G.E. might have benefitted from additional examples showing how to work the circle rules.

For lessons on division (4:149) stories could be given as examples suggesting the teacher substitute names of students in the class. For example for $3\overline{)12}$:

> There were 12 rows of plants to weed. A, B, and C had to share the work evenly between them. How many rows should each person weed?

In lessons 6.1 and 6.2 G.E. requested background information on various counting systems. In the lesson using Roman numerals, historical information about the Romans might be helpful.

Often the objective of an entire lesson was not clear. Objectives for each lesson can be stated clearly in a sentence or two, possibly clarrifying the lesson in the teacher's eyes. For example:

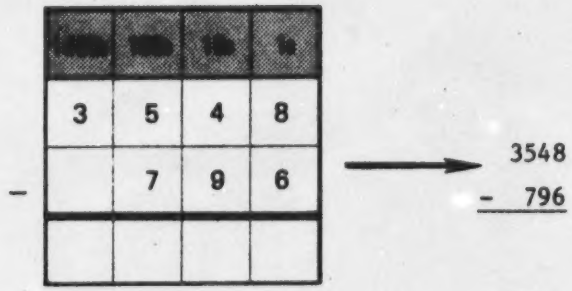
> Lessons 2:55: overall objective:
> Students will be able to put objects in order according to a variety of attributes.

Lesson 55A: students will run a race, then order the racers according to speed.

Lesson 55B: students will order a group of figures according to their age.

Evaluation of Instructional Activities

All grade levels could use more practice in making the transition from IMP activities to conventional symbolic operations. Children that easily worked problems in place-value tables sometimes had trouble working problems without them. More examples such as the one below might help ease the transition.



Grade 2: Time constraints did not allow G.E. to implement any grade 2 activities. He moved through the grade 2 lessons at a slow pace. At first he seemed unsure of his ability to work with grade 2 children. He refused to go on to the next lesson until he was sure every child understood the preceeding one. Often he spread out a lesson over several days (e.g. 53A, 53C, 53D, 55A).

Number Operation lessons were at an appropriate level for the children and much learning seemed to take place. However, in grade 2 so much time was spent copying and transferring work from the small blackboards to their exercise books that far less was accomplished than planned (e.g. 56D). I feel the transfer from boards to books is unnecessarily time consuming and confusing to standard two students. The time could more profitably be spent on actually solving problems. Perhaps duplicated worksheets or consumable workbooks would be more appropriate at least for standard two pupils. Also, more practice should be given later on using conventional problems (i.e. without place-value tables) for transitional purposes.

Measurement lessons were enjoyed immensly by the students but also involved too much copying. I suggest using cross-curricular approaches. For example:

1. Instead of copying pictures in activity 55B, select 5 students to roll play the people of different ages and have the class physically put them in order;

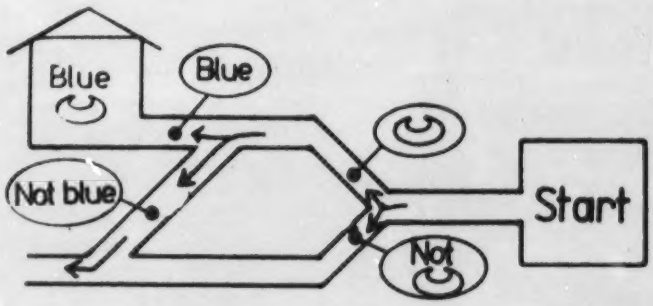
2. Instead of copying the sequence of pictures on lesson 56E, the teacher could tell a story in five parts, one part each day for a week. The sudents could draw a picture to go with each segment and on the sixth day cut and put them in the correct time order.

Grade 4:

Classification lessons using Kina Cards were initially confusing. The cards were easily recognized but the "houses" where classification takes place must be clarified (e.g. 145C, 145D). There was a lot of confusion over which way you were supposed to go on the roads.

Example:

Use arrows to show one-way roads:



Students starting the track with a green fish would first start down as it was NOT Kina. Then the green fish would turn Right at the next street, as it was NOT Blue. Thus the final house would hold blue Kina as well as all other objects of all colors except blue. The correct conjunctive (logical) response is blue Kina only. Directions must be more thorough as many teachers have not done this type of classifying before (even though it is in the present grade 4 curriculum).

Circle-rule relation games (146 lessons) need more detailed instructions. Just a simple statement of the rules is not sufficient. Although this might have been discussed at the IMP in-service, a reminder placed in the Teachers Notes with worked examples would be beneficial. G.E., for example, did not remember exactly how to apply the rules.

In lesson 146C one example of a complete answer, written as a sentence, should be included in the instructions. ("The boy eats in the house.") G.E. complained that he did not know it was to be written as a sentence. Once the lesson was explained he was able to teach it effectively using the IMP books. During this lesson school inspectors (3 visiting especially to observe the IMP) commented on the ease with which the students understood. They were comparing this experience with other times they had observed the lesson taught from the existing MaCS curriculum.

The number operation lessons went extremely well. G.E. had problems understanding the new model of division. An elaborated description of the process in Teachers Notes should clarify the situation greatly. Problems arose in lessons 149D, 149E due to the time consuming task of cutting out squared paper into desired blocks. Ninety minutes (or 6 maths lessons) were taken up just constructing the materials. I question whether sufficient instructional benefit is derived from the experience relative to time spent. No measurement lessons were implemented due to time limitations.

Grade 6:

Some number operation lessons were very good, others ineffective. In the urban setting of Ororo School lesson 6-1 on traditional counting systems seemed irrelevant. If it had been presented in a semi-historical perspective I feel students would have benefitted more from the activity. As it stood the prevailing atmosphere during the lesson was tense to say the least. Students did not know their traditional counting systems and appeared ashamed to admit the fact.

The place-value tables and games (6-7 especially) gave the students much insight into the computation skills they were trying to comprehend. Again more practice is needed transferring that knowledge to problems

where place-value tables are not provided. For example, show problems on squared paper leaving off the grid and then give the same problems on unsquared paper. I also suggest supplying the number cards for lesson 6-7. It took over 3 maths lessons for the children to produce them.

The pace of the multiplication lessons seemed much too fast for students at Ororo. Because the students did not know their multiplication facts they were not prepared to play the multi-fact game - many more multiplication practice activities are needed. Apparently they had little practice with multiplication facts prior to this lesson.

Note: one student thanked G.E. for the IMP lessons - it was the first time he had understood an entire maths lesson, and the only time he had understood place-value! (Lesson 6-7).

Evaluation of Teachers Notes

Teachers Notes must give more elaborated explanations, especially why certain materials and methods are utilized (e.g. use of squared paper, reason for a race (55A), why working in groups is important). If short paragraphs are included the teachers would have a better understanding of the nature of the lesson and in turn the students would receive more comprehendable lessons. I suggest the following format for each lesson:

1. purpose and time allotment for lesson
2. materials needed - preparation (time requirements as well as instructions)
3. step by step guide (notes on choice of materials and methods)
4. ideas for evaluation
5. ideas for related corrective and extention activities if warrented by evaluation.

Evaluation of Learning Aids

Base-10 materials. Very difficult to cut out. They were not punched as well as the Kina Cards. Materials were very effective however.

Kina Cards. Fantastic. There was some confusion - G.E. thought one side meant pig and the other side referred to the color only. The students and the teachers enjoyed using these aids.

Coin Cards. The silver paint came off on my hands while punching them out. Very useful aid otherwise.

Measurement Devices. Not used due to time constraints. I suggest an in-service or source book of ideas for their use. Ororo Community School already had some measurement devices but they'd never been used.

Other Materials. Place-value cards (lessons 6.7) and squared-paper flash cards (149D) should be ready made materials. Also cards should be made for ordering time in grade 2. All materials held up well. The children took special care of them.

Overall Conclusions

The Teachers Notes need to provide more general background information and detailed teaching hints. The in-services should include practice in techniques of encouraging student-student interaction as well as practice working in groups.

LESSONS IMPLEMENTED - ORORO COMMUNITY SCHOOL

Grade level	Lesson Codes	Detailed	Total lessons taught
2	53A, 53B, 53C, 53D, 53E, 53F, 53G, 53H, 53I-1, 53I-1, 55A, 55B, 55C, 55D, 56A, 56B, 56C, 56D, 56E.	10	19
4	144A, 144B, 144C, 144D, 144E, 144F, 145A, 145B, 145C, 145D, 146A, 146B, 149A, 149B, 149C, 149D, 149E, 149F-1, 149F-2.	9	21
6	6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8, 6-9, 6-10, 6-11, 6-12, 6-13, 6-14, 6-15, 6-16, 6-17, 6-18, 6-19, 6-19, 6-20, 6-21, 6-22.	9	22

Note: Underline denotes detailed curriculum implementation information.

Language Use

It was difficult to record students speaking Tok Ples (Motu or other vernacular) and Pidgin. If they saw me recording them while they were speaking a language other than English, they would quickly switch to discussion of the lesson in English, or stop talking altogether.

Language did not change in teacher directed lessons. (Twice in grade 2 G.E. called students to attention in Pidgin.) Language changed only when grade 2 broke into groups, and a few times when grade 4 broke into groups. Subsequently Language-Use data is very similar to data collected on the Classroom Interaction form.

LANGUAGE USE LESSONS - ORORO COMMUNITY SCHOOL

Grade level	Lesson Code	Total
2	53C, 55B, 56B.	3
4	144B, 145B, 146C, 149C	4
6	6-2, 6-6, 6-15, 6-22	4

Overall Summary

English is spoken predominantly in the classroom. When Pidgin or Tok Ples is spoken in the classroom:

1. T speaks English and one student translates (grade 2 only)
2. T speaks in Pidgin to get attention (grade 2)
3. Students in small groups giving directions to each other in Pidgin. This occurred in grade 2 every time the class broke into groups (2:53A, 53B, 53C, 53D, 53E, etc.). I saw it happen twice in grade 4 (149D). No examples were observed in grade 6
4. Students speaking in Pidgin or Tok Ples when T is speaking (i.e. they are not paying attention), (144B, 53D.)
5. Students speaking Pidgin when passing out materials (146C).

Almost daily I sat for fifteen minutes outside during break-time (one half hour tea break at 10:00). I would sit in different spots and watch the students on the playground. I observed primarily English spoken in

grades 3, 4, 5 and 6. For grades 1 and 2, both English and Pidgin were widely used though Tok Ples was seldom heard. As children come from many different areas many do not speak the same Tok Ples. Also, as became evident in speaking with the community, many children brought up in Port Moresby cannot speak their own Tok Ples. Though they may understand some of their vernacular, Motu (widely spoken along the South coast) or Pidgin (a trade language developed on the North coast) is usually their first language.

Due to living in the Westernized environment of the National Capital District, most children generally speak English. Only children who are fresh from their village appear to have trouble with English. They seem to learn quickly in a total immersion environment. For many English is their third or fourth language.

Classroom Interaction

At times classroom interaction variables were difficult to document due to the rapid change of speakers and the Fill-In-The-Blank manner of interchange (i.e. teacher says "2 + 2 is"; students say, "Four"; teacher says "4 + 2 is"; students reply, "six"; etc.). However, it was fairly easy to recapture information not coded during class time by reviewing the audio-taped lessons. For instance I would write down the dialogue, then go back and fill in who said what to whom.

AUDIO-TAPED CLASSROOM INTERACTION LESSONS
ORORO COMMUNITY SCHOOL

Grade level	Lesson Codes	Total
2	53D, 55C, 56C	3
4	144C, 145C, 146D, 149E	4
6	6-3, 6-7, 6-9, 6-21	4

Overall Summary of Classroom Interaction

Many lessons were strictly dictated to the class with little interaction between students and the teacher. As a general rule G.E. would give

information then run a Fill-In-The-Blank (146D, 144E) series of questions until almost the entire class answered correctly. Then the class would proceed with the activity.

Example of Fill-In-The-Blank style from lesson 4:146D:

T = This is ....?
Cl = Square
T = And square turns into ....?
Cl = Triangle
T = Triangle turns into ....?
Cl = Diamond
T = Diamond turns into ....?
Cl = Circle

A FIB system was also used to correct exercizes. Very little interaction took place (formally) between students. Most interaction was teacher directed. Generally the teacher and only one student were involved in the interchange. Occasionally whole class fill-ins were initiated by the teacher as well (see tapes 144E, 145C, 54D).

Student Interviews

As soon as I found talkative students (i.e. as soon as the students got used to me) student interviews were enjoyable. They afforded considerable insight into what the children actually understood the lessons to be about.

STUDENT INTERVIEW LESSONS - ORORO COMMUNITY SCHOOL

Grade level	Lesson Codes	Total
2	53E, 55D, 56D	3
4	144F, 145D, 146B, 149D	4
6	6-4, 6-8, 6-10, 6-20	4

Summary of Student Interviews

Student Interviews were enlightening. At times I felt students were not understanding the entire concept. Because the indepth clinical nature of the interviews allowed me to follow up on interesting questions, I found in several cases where the students did understand when my first impression was just the opposite. Lesson 2:56D appeared to be a total chaos situation to me. I felt that none of the children actually understood the rules of the leaf exchange. When my informant (KR) arrived for the interview, however, I found my thoughts erroneous. KR understood the lesson perfectly and proceeded to explain the entire game, rules included, in one breath! This same erroneous thinking caught me on two other occasions, AE in lesson 4:145D and TG in lesson 6-10.

After the initial interviews children spoke more freely with me. The most difficult comments to elicit were those responding to "WHY" queries (e.g. Why did G.E. give this lesson?). Students were not used to answering interpretative and evaluative questions about lessons (or anything else for that matter).

One student in grade four, HT, was sent to me to interview because he was identified as a "low" student, particularly in maths. By the end of IMP HT seemed to be understanding maths very quickly. By the end of the six weeks G.E. remarked that he was now a "top" maths student.

Summary and Conclusions

Overall I found both the school and community very accepting. The staff were proud to be a part of IMP and did much to accommodate the project (and me). The headmaster had a paternal attitude towards me, and the rest of the teachers made me feel like a sister. Then, remarkably, the relationship was transformed during actual observation periods, enabling me to adequately influence the course of events to ensure that my research responsibilities were met.

The materials were well liked by teachers, students and the headmaster. When officials visited the school, the headmaster always showed them the IMP materials. The students were careful to keep them in good condition. G.E. used the materials as an integral part of the MaCS curriculum and feels they made the teaching easier and more meaningful to his students.

Although the Language-Use and Classroom-Interaction forms were difficult to use at first, I found them extremely useful in helping me to focus attention on specific insructional variables.

At Ororo there is not much shifting of languages in the classroom. Therefore Language-Use documentation was roughly equivalent to Classroom-Interaction data. I think it will be interesting to compare Language-Use and Classroom-Interaction variables across the five IMP sites. After talking with other members of the IMP team I believe we will discover similar teaching styles (by comparing Classroom-Interaction variables) and a variety of language patterns (by comparing Language-Use variables).

From my observations and discussions with IMP observers it seems that all Teachers Colleges basically offer the same type of teacher preparation. The main teaching style is teacher directed, using Fill-In-The-Blank and other "convergent question" formats. I seldom, if ever, heard a question stimulating students to think (i.e. interpretative or evaluative questions fostering personal thoughts and decisions on the part of the students). In virtually all the classrooms I visited at Ororo School, the teacher (or radio broadcast) acted as the focal point of attention, asking questions, the answers to which clearly resided in the teacher.

In the question of language patterns, I would assume that in a more rural setting, where children do speak a traditional language in the home, and where classmates are also "wantoks", we would see more Tok Ples in the classroom. However, in speaking with observers from Divinap (an extremely isolated school in West Sepik Province) it appears the home influence might be counteracted by a strong enforcement of "English is spoken in school" rule.

Recommendations

At present the Teachers' Notes assume the teachers have more knowledge than they do. The Teachers' Notes must give very explicit instructions and background information (i.e. if squared paper is to be used, include a short explanation of why it is a useful aid. If a place-value table is to include a "working-space", explain why).

Teachers' Notes should include some type of process for evaluating the lesson as well as examples of additional lessons on the same subject should the evaluation indicate poor understanding on the part of the class.

Teacher Training (pre-service as well as in-service) must give teachers experience in working with small groups. Many teachers did not seem to have experience working with small groups in academic areas. Lessons often require group work but the entire concept seems new to teachers at Ororo. After teachers understand why it is important to work in group settings, they must learn how to manage a group lesson in order to get maximum efficiency from group activities.

Improvision should also be practiced during in-service sessions since instructional materials may often have to be improvised to accommodate regional and cultural differences. Hypothetical questions such as "How would you do lesson 4:149A without kau-kau?" might help alleviate problems experienced by teachers in diverse settings.

The task of improving the quality of mathematics education in Papua New Guinea community schools is immense. With such a diversity of languages and cultures, and the practical necessity of implementing one standard curriculum, many compromises must be made. Among the five IMP school sites alone we found a wide range of language and mathematics abilities between students in all grades. Developing a single curriculum for such diverse needs will be a considerable task indeed.

One potential solution is already being used in Papua New Guinea to teach a variety of subjects; that is distance teaching using radio broadcasts. Broadcast lessons in mathematics especially for the early

grades might be prepared by master teachers using the classroom teacher as a tutor. This method has both positive and negative effects. Though we can ensure consistency of content and organization, we cannot ensure the lessons will be followed up adequately by individual teachers. Distance teaching would seem to have considerable potential in Papua New Guinea though attention would have to be paid to support materials and in-service training, just as with any other curriculum innovation.

SUMMARY OF RECOMMENDATIONS

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Materials:

1. Base-10 materials should be easier to separate 12
2. Measurement Devices require in-service and teachers manual for effective use 13
3. Materials for lessons 149D, 149E, and 6-7 should be ready made 11, 13

Actual Lessons:

1. 4:145C, 145D need clarification of use of one way roads. . 10
2. 4:146 needs clarification of circle rules 11
3. 4:149F needs an elaboration of the introduction to division 7-8, 11
4. 6:6-1, 6-2 could be dealt with from more of an historical perspective to pose less threat to students 11
5. Slow down the pace of multiplication for grade 6 12

General:

1. Background information for lesson, purpose of lesson . . . 8, 9, 19 11, 12, 13
2. Suggestions in Teachers' Notes for implementation of lesson 8
3. Suggestions in Teachers' Notes for evaluation of lesson. . 19
4. Organizational hints added to Teachers' Notes 8
5. Addition of transitional exercises from IMP style to traditional. 9, 11, 12
6. Use of cross-curricular methods of consumable workbooks to avoid voluminous copying 9-10

In-service Needs:

1. Practice with group work management 19
2. Dealing with improvisation of materials 19
3. Dealing with measurement devices 13

Other:

1. Possibility of IMP Mathematics Radio Broadcast 19-20

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R Souviney, January 1980

2 Strategies for Mathematical Problem Solving.
R Souviney March 1980

3 Assessment Administration Guide.
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4 Field Guide for Documenting Classroom Events and Community Environment.
P Levin, M Gearhart and R. Souviney, June 1980.

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R Souviney, V. Kada and D. Malaga; D. Lancy; M. Britt; B. Roberts, August 1980.

6 Andra Community School Field Report.
P Levin, November 1980

7 Ororo Community School Field Report.
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8 Divanap Community School Field Report
M Gearhart, November 1980

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K Johnson, November 1980

10 Muglamp Community School Field Report.
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11 Teachers Notes and Student Worksheets - Grade 2 1980.

12 Teachers Notes and Student Worksheets - Grade 4. 1980.

13 Teachers and Students Text - Grade 6. 1980.